Citation:

Welsh JA, Cogswell ME, Rogers S, Rockett H, Mei Z, Grummer-Strawn LM. Overweight among low-income preschool children associated with the consumption of sweet drinks: Missouri, 1999-2002. *Pediatrics*. 2005 Feb; 115 (2): e223-e229.

PubMed ID: 15687430

Study Design:

Retrospective Cohort Study

Class:

B - Click here for explanation of classification scheme.

Research Design and Implementation Rating:

POSITIVE: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To examine the longitudinal association between the consumption of all commonly consumed sweet drinks and the incidence and persistence of overweight among pre-school children.

Inclusion Criteria:

- Children aged two and three years
- Enrolled in the Missouri WIC program between January 1999 and December 2001
- Had at least one clinic visit at which height and weight data were collected and reported to the PedNSS
- Had data collected as part of the Missouri Demonstration Project
- Have height and weight data collected one year after initial data was collected.

Exclusion Criteria:

- Records lacking missing values for key variables
- Extreme BMI values (Z-scores less than or equal to four or more than five).

Description of Study Protocol:

Design

Retrospective cohort design that combined data collected through the Missouri WIC program for PedNSS and the Missouri Demonstration Project, with one-year follow-up data on height and weight.

Dietary Intake/Dietary Assessment Methodology

The HFFQ, a validated food-frequency questionnaire (FFQ) developed by Harvard University was used to collected dietary data.

Statistical Analysis

- Consumption of beverages was calculated in terms of the average number of times sweet drinks were consumed daily and categorized as follows:
  - Zero to less than one drink a day
  - One to less than two drinks a day
  - Two to less than three drinks a day
  - Three or more drinks a day
- Comparisons were made between those who consumed zero to less than one drink a day and those who consumed more
- Bivariate analysis was used to assess the unadjusted relationship between the exposure and outcome variables and between potential confounders and the outcome variables
- Logistic regression was used to adjust for potentially confounding variables
- Results were stratified by three categories of baseline BMI.

Data Collection Summary:

Timing of Measurements

- Data was collected from the Missouri WIC program and PedNSS was collected between January 1999 and December 2001 and during the same time period data was collected on the same children for the Missouri Demonstration Project
- A follow-up clinic visit during which height and weight was measured was conducted one year following baseline data collection.

Dependent Variables

Weight status was determined using measured height and weight.

Independent Variables

Sweet drink intake was assessed using the HFFQ. Sweet drinks included vitamin C juice, other juices, fruit drinks and soda.

Control Variables

- Age
- Gender
- Race/ethnicity
- Birth weight
- Intake of high-fat foods and sweet foods
- Total energy intake.

Description of Actual Data Sample:

- *Initial N:* N=96,756 children enrolled in WIC with at least one clinic visit during the study time period; N=45,499 of these children also had their dietary intake assessed during the

study time period as part of the Missouri Demonstration Project
- *Attrition (final N):* N=10,904 children who had completed data (50.1% were female)
- *Mean age:* 33.8 months
- *Ethnicity:* 88.6% white, 5.8% black and 5.6% other
- *Anthropometrics:* 14.5% were at risk of overweight, and 10.1% were overweight
- *Location:* Missouri, United States.

Summary of Results:

- Daily consumption of drinks averaged 0.3 for soda, 0.7 for fruit drinks, 1.0 for vitamin-C containing juices and 1.0 for other juices
- 80% of children consumed sweet drinks once or more daily and 41% consumed these drinks at least two times daily
- Energy intake increased as the consumption of sweet drinks increased with mean calories consumption for those who consumed zero to less than one drink a day, one to less than two drinks a day, two to less than three drinks a day and three or more drinks a day (1,425, 1,596, 1,771 and 2,005, respectively)
- Children who were at risk of overweight at baseline and consumed one to less than two drinks a day, two to less than three drinks a day and three or more drinks a day, respectively, were 2.0 (95% CI: 1.3 to 3.2), 2.0 (95% CI: 1.2 to 3.2), and 1.8 (95% CI: 1.1 to 2.8) times as likely to become overweight as the referent (zero to less than one drink a day)
- Children who were overweight at baseline and consumed zero to less than one drink a day, one to less than two drinks a day, two to less than three drinks a day and three or more drinks a day respectively, 2.1 (95% CI: 1.3 to 3.4), 2.2 (95% CI: 1.4 to 3.7) and 1.8 (95% CI: 1.1 to 2.9) times as likely to remain overweight as the referent (zero to less than one drink a day).

Author Conclusion:

For children who were either at risk of overweight or overweight at baseline, sweet drink consumption was significantly related to likelihood of being overweight at follow-up.

Reviewer Comments:

- *This study was unable to control for some key potential confounding factors, including television viewing, parental overweight and lack of breastfeeding*
- *Baseline dietary intake data was used as an indicator of consumption during the follow-up period*
- *The study population used may limit the generalizability of the findings.*

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

1.	Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies)	Yes
2.	Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?	Yes
3.	Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice?	Yes
4.	Is the intervention or procedure feasible? (NA for some epidemiological studies)	Yes

Validity Questions

1.	**Was the research question clearly stated?**	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	Yes
2.	**Was the selection of study subjects/patients free from bias?**	Yes
2.1.	Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study?	Yes
2.2.	Were criteria applied equally to all study groups?	Yes
2.3.	Were health, demographics, and other characteristics of subjects described?	Yes
2.4.	Were the subjects/patients a representative sample of the relevant population?	Yes
3.	**Were study groups comparable?**	Yes
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	N/A
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	Yes

3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	Yes
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	**Was method of handling withdrawals described?**	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	Yes
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	**Was blinding used to prevent introduction of bias?**	Yes
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	N/A
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	Yes
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	**Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were interveningfactors described?**	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes

6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	No
6.6.	Were extra or unplanned treatments described?	No
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	**Were outcomes clearly defined and the measurements valid and reliable?**	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	**Was the statistical analysis appropriate for the study design and type of outcome indicators?**	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes
8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	No
9.	**Are conclusions supported by results with biases and limitations taken into consideration?**	Yes
9.1.	Is there a discussion of findings?	Yes

9.2.	Are biases and study limitations identified and discussed?	Yes
10.	**Is bias due to study's funding or sponsorship unlikely?**	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes